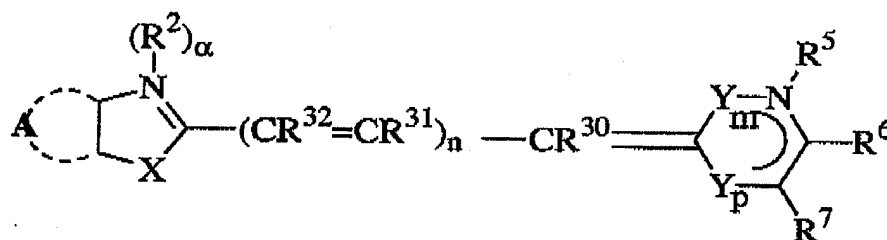


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### REMARKS

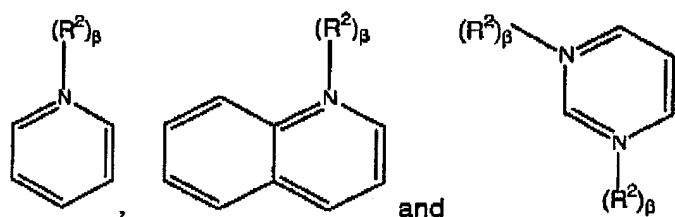
#### The Claimed Invention

The claimed invention is directed to aza-benzazolum containing cyanine dyes that are useful for staining nucleic acid polymers and poly(amino acids) having the formula:

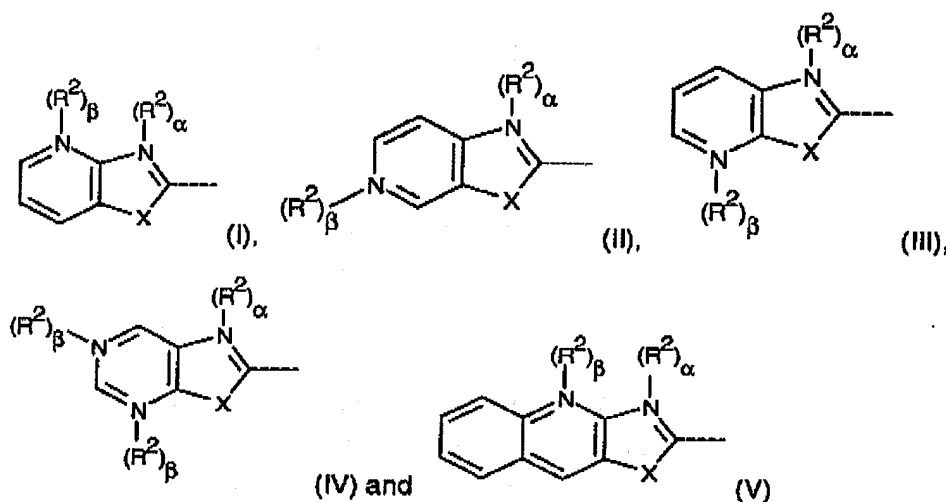


These compounds comprise a first heterocyclic ring system that is a substituted aza-benzazolum ring (left side), a methine bridge and a second heterocyclic ring (right side) that is a pyridine, a quinoline, a pyridinium or a quinolinium (page 3 lines 29-31; page 4 line 1). The aza-benzazolum moiety comprises the A moiety and the fused five membered ring of the unsymmetrical cyanine dye wherein the A moiety comprises "the atoms necessary to form one to two fused aromatic rings having 6 atoms in each ring selected from the group consisting of -C-, CH or N(R<sup>2</sup>)<sup>α</sup>, provided at least one of said ring atoms is N(R<sup>2</sup>)<sup>α</sup>, wherein aromatic carbon atoms are optionally substituted one or more times by substituents selected from the group consisting of hydrogen, alkyl having from 1-6 carbons, alkoxy having from 1-6 carbons, trifluoromethyl, halogen, methylthio, -L-R<sub>x</sub> and -L-S<sub>x</sub>" (See, Claim 1). Preferably, the A moiety is a pyridine, a quinoline, or a pyrimidine, represented by the following structures (page 4 line 20; page 5 lines 1-4 and Claim 2):

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Accordingly, the preferred aza-benzazolum moieties are selected from the group consisting of



wherein X is permitted to be oxygen (oxazole) or sulfur (thiazole), nitrogen has been specifically excluded from the presently claimed compounds, *see* amended Claim 1 and Claim 2.

#### The Pending Claims

Prior to consideration of the following Response to Office Action, Claims 1-74 are pending. Claims 1-14 are directed to aza-benzazolum containing cyanine dyes. Claims 15-16 and 18-22 are directed to a complex comprising a nucleic acid polymer and a dye according to any one of Claims 1-14. Claims 24-27 and 51 are directed to a complex

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comprising a poly(amino acid) and a dye according to any one of Claims 1-14. Claims 28-38 are directed to a method for staining poly(amino acids) with dyes according to any one of Claims 1-14. Claims 39-43 are directed to a method for staining nucleic acids with dyes according to any one of Claims 1-14. Claims 44 and 46-50 are directed to a kit comprising a cyanine dye of the present invention. Claims 52-65 are directed to aza-benzazolium containing cyanine dye compounds wherein the A moiety is according to Formula I, see page 4 of the present application. Claims 66-68 are directed to aza-benzazolium containing cyanine dye compounds wherein the A moiety is according to Formula IV, see page 5 of the present application. Claims 69-74 are directed to a solution for staining nucleic acid polymers or poly(amino acids) comprising a cyanine dye according to any one of Claims 1-14.

#### The Office Action

Claims 1-74 are restricted and Claims 3, 5-9 and 11-74 are provisionally withdrawn from consideration. Claims 1, 2 and 10 stand rejected under 35 U.S.C. 102(b) as being unpatentable over Heseltine (4,003,750). Claim 4 stands rejected under 35 U.S.C. 103 as being unpatentable in view of Heseltine (4,003,750).

#### Amendments

Claims 1, 15, 24, 44 and 69 have been amended to correct a typographical error in the structure as drawn. Support can be found in Claim 2 as filed and on p. 66 compound 14 and 15; p. 67 compound 16 and 17; p. 68 compound 18-20; p. 69 compound 21, 44 and 22; p. 70 compound 23; p. 71 compound 24 and 25; p. 72 compound 26 and 27; p. 73 compound 47 and 28; p. 74 compound 45 and 46; p. 75 compound 29 and 30; p. 76 compound 41 and 31; p. 77 compound 32 and 33; p. 78 compounds 34-37; p. 79 compounds 38-40; p. 80 compound 48; p. 81 compound 49 and 50; p. 82 compound 51 and 52; p. 83 compound 83 and 54; p. 84 compound 55; p. 85 compound 56 and 57; p. 86 compound 58 and 59; p. 87 compound 60.

Claims 1, 15, 24, 44, 52, 66 and 69 have been amended to remove "Se, NR<sup>15</sup>, and CR<sup>16</sup>R<sup>17</sup>" as possible substituents for X. This amendment to Claim 1 was originally made in a Preliminary Amendment dated December 6, 2000 but was not entered in the

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claims prior to Examination. Thus, for clarity the amendment is being made again and to the other identified Claims.

Claim 4 has been amended to remove "each X is independently O or S" because based on the amendment of Claim 1 this was not a further limitation.

Claims 52, 66 and 70 have been amended to correct a typographical error in the structure as drawn. Support can be found on page 4 line 20; page 5 lines 1-5 (aza-benzazolium moiety I and IV).

Claims 53 and 71 have been amended to remove "X is O or S" because of the amendment to Claim 52 and Claim 70, respectively, limiting X to O or S.

Applicants believe that no new matter has been added by any of these amendments and the Examiner is respectfully requested to enter them.

#### **RESPONSE TO ELECTION/RESTRICTIONS**

In the response that follows, the Examiner's Election/Restriction of the Applicant's claimed invention is provided in full text, as identified by Indented small bold print, followed by the Applicants response.

Applicant's election with traverse of Group I in Paper No.6 is acknowledged. The traversal is on the ground(s) that the inventions of the two groups are not distinct because the inventive compounds are advantageous. This is not found persuasive because the fact that the claimed compounds may be better does not render the groups not distinct, and any asserted superiority is not relevant to the distinctness analysis. Thus, since the restriction is based upon groups which are properly distinct and for which a search burden is present, the requirement is maintained.

With regard to the species election, Applicants submitted a corrected species election to elect the compound 4-(6-chloro-2,3-dihydro-4-methyl(thiazolo[4,5-b]pyridin-2-yl)methylidene)-1-methylquinolinium tosylate, which is indicated as being exemplified as compound 40 on page 79 of the specification. As will be noted below, this species is free of the prior art. This species is read upon by claims 1, 2, 4 and 10 as noted by Applicant. Therefore, a search of other species within the genus was performed and the rejection below is the result. Claims 3, 5-9 and 11-74 which are not rejected below are withdrawn as not drawn to the elected species.

The requirement is still deemed proper and is therefore made **FINAL**.

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With regard to the elected species by the Applicants and in view of the Examiner's comments, the Applicants would like to clarify that in the supplemental response to Restriction Requirement, Applicants indicated that the elected compound was covered in Claims 1, 2, 4, 10, **52-54 and 58**, see page 8 of supplemental response. Claims 52-65 are subgenus claims specifically directed to present compounds wherein the A moiety is a pyridine (azabenzene) and the aza-benzazolum moiety is according to Formula I; see page 4 line 20 of the present application. Dependent Claim 58 specifically covers only the elected species.

Applicants request that Claims 52-54 and 58 not be withdrawn from consideration because the elected species compound is covered by these claims and request that these claims be examined on the merits.

### **RESPONSE TO THE REJECTIONS**

In the response that follows, the Examiner's individual rejections are provided in full text, as identified by indented small bold print, followed by the Applicants response.

#### **35 U.S.C. 102(b) Rejection**

**Claims 1, 2 and 10 are rejected under 35 U.S.C. 102(b) as being anticipated by Heseltine et al (U.S. Patent 4,003,750).**

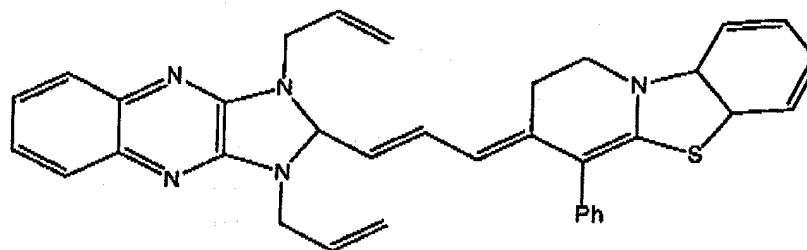
This rejection is respectfully traversed because the disclosed compound in the '750 patent does not fall within the scope of the presently claimed compounds.

In a Preliminary Amendment filed on December 6, 2000, Applicants had amended Claim 1 wherein X of the aza-benzazolum moiety was limited to O or S. These amendments appear to have not been entered prior to Examination; therefore applicants are again amending Claim 1 in this respect, as this amendment is directly relevant to the anticipation rejection. In addition to other structural differences, the Heseltine compound requires a nitrogen at the corresponding X position.

Furthermore, Applicants respectfully assert that Claims 2 and 10 are not anticipated by the '750 patent.

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Haseltine teaches a compound having formula:



(see column 12, example 3, lines 55-end).

This compound meets the claim, since there is an A, which represents the atoms necessary to form two fused aromatic rings having 6 atoms in each ring wherein some of the ring atoms are nitrogen,

Where X is selected from the group consisting of  $NR^{15}$ , with  $R^{15}$  being an alkyl group with three carbons,

Where  $\alpha$  is 0 and  $\beta$  is 1 so that  $\alpha + \beta = 1$ ,

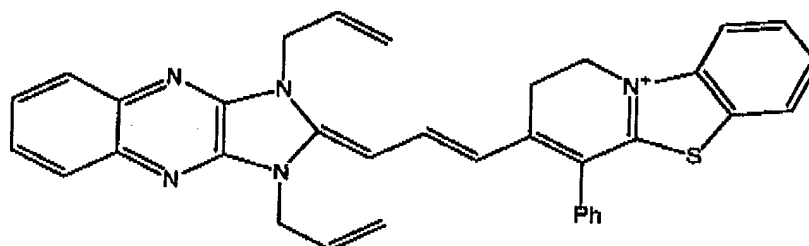
Where  $R^2$  is an alkyl group having three carbons,

Where  $n=1$ ,

Where Y is  $C=C$  and  $m+p=1$

And where the remaining substituents permit the presence of the cyclic substituents and the aromatic ring. In particular,  $R^3$ ,  $R^4$ ,  $R^5$  and  $R^6$  are all indicated as being permissive of having a cyclic substituent which may have 1-6 carbons, as well as various alkyl groups which may have 1-6 carbons, which may be substituted.

First, Applicants would like to respectfully point out that the Examiner has not correctly drawn the Haseltine compound as it appears in the '750 patent. Applicants would like to submit a correctly drawn structure incorporating additional bonds not identified in the Examiner's structure; the correctly drawn structure is represented by the following structure:

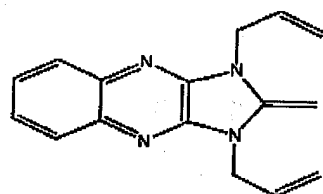


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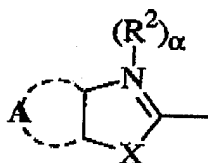
Applicants will refer to this correct structure in the remainder of the response.

Applicants respectfully assert that the '750 patent does not anticipate the presently claimed compounds because the Heseltine compound cited by the Examiner contains at least three structural differences compared to the presently claimed compounds of Claims 1, 2 and 10; two of which are requirements of the presently claimed compounds that are not disclosed for the Heseltine compound and the third is a requirement of the '750 patent that is not disclosed for the present compounds. These difference are 1) the aza-benzazolum moiety that includes both the i) A moiety and the ii) five membered fused ring and 2) the substituents of the pyridine that form the substituted heteroaryl on the right side of the compound which differ from the required Y or Y' moiety of the '750 patent. The Y and Y' moiety of the '750 patent are not equivalent to any moiety of the present compounds.

The moiety of the Heseltine compound that corresponds to the aza-benzazolum moiety of the presently claimed compounds has the following structure:



The aza-benzazolum moiety of the present invention

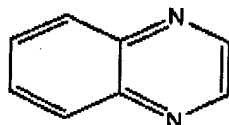


has the following structure:

wherein X is O or S and the A moiety is as defined above for Claim 1 and limited to pyrimidine, a quinoline, or a pyridine for Claims 2 and 10.

The first point of difference between the Heseltine compound and the presently claimed compounds is the A moiety of Claims 2 and 10. These claims limit the aza-benzazolum moiety to five preferred formulas wherein the A moiety is a pyridine, a quinoline or a pyrimidine (see, structures above). The corresponding A moiety of the Heseltine compound is the following structure, the nitrogen ring commonly referred to as




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quinazoline. Comparison of these A moieties, the present A moieties of Claims 2 and 10 and the Heseltine corresponding A moiety, demonstrates that the '750 patent does not anticipate the presently claimed compounds of Claims 2 and 10. Specifically, Claim 2 does not permit two nitrogen atoms that are *para* in the A moiety; only an A moiety comprising two nitrogen atoms that are *meta* is claimed (pyrimidine).

The second point of difference between the Heseltine compound and the presently claimed compounds of Claims 1, 2 and 10 is the five membered ring that is fused to the A moiety to form the aza-benzazolum moiety. The Heseltine compound contains a nitrogen atom at the location that correlates to the X position of the present compounds. As stated above, X is not permitted to be nitrogen. Thus, the '750 patent does not anticipate the presently claimed compounds.

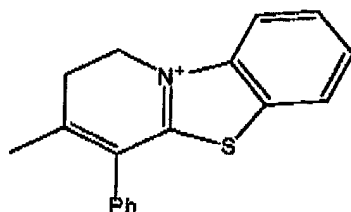
By way of example, the five membered ring of the present aza-benzazolum

moiety is permitted to be  or  but not  as is required in the Heseltine compound of the '750 patent cited by the Examiner. Furthermore, the bottom nitrogen on the '750 patent is substituted by an alkyl group; the O and S are not disclosed to be substituted, nor could they be.

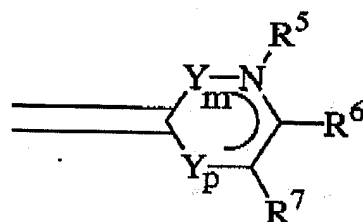
The third point of difference between the Heseltine compound and the presently claimed compounds of Claims 1, 2 and 10 is the permitted substituents of the pyridinium ring on the right side of the compound wherein the pyridinium ring is directly attached to the methine bridge. The Heseltine compound contains a pyridine ring attached to the methine bridge at the 4- carbon and having fused to the 1,2 side of the pyridine a 5-membered heteroaryl that is subsequently fused to a benzene ring (column 1 lines 19-26). These fused rings being commonly referred to as benzothiazole and correspond to the Y or Y' moiety of the '750 patent that is a *requirement* for all of the disclosed compounds, including the compound specifically cited by the Examiner. The Heseltine compound having the following pyridine moiety that comprises a required Y moiety:



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. The corresponding 1,2- positions of the pyridinium moiety on the presently claimed compounds is R<sup>5</sup> and R<sup>6</sup> respectively having the following



formula:

wherein Y is  $-CR^3=CR^4-$  and  $m + p = 1$  (see, Claim 1). The pyridinium substituents, R<sup>5</sup> and R<sup>6</sup>, are permitted to be a CYCLIC SUBSTITUTENT (see page 11 line 31:page 12 lines 1-7), which does not include a fused heteroaryl group but rather a heteroaryl attached by a single covalent bond to the nitrogen atom; these R positions are not permitted to form a fused ring system. The Y or Y' moiety of the '750 patent requires that the nitrogen atom of the pyridine be shared between the ring structures. Thus, the compounds disclosed in the '750 patent contain a requirement that is completely absent from the present compounds.

In summary, Applicants respectfully assert that the present compounds contain numerous structural differences compared to the Heseltine compound. Specifically, Claim 1 is not anticipated by the Heseltine compound due to the differences of the fused five-membered ring of the aza-benzazolum moiety and the pyridinium substituents (Y moiety) on the right side of the compound. Claims 2 and 10 are not anticipated by the Heseltine compound due to the differences of the aza-benzazolum moiety including both the A moiety and the fused five-membered ring and due to the pyridinium substituents (Y moiety) on the right side of the compound.

In addition to these structural differences, Applicants believe the amendments to Claim 1 wherein nitrogen is removed as a possible X substituent further preclude the '750 patent from anticipating Claim 1 of the present application. Furthermore, the currently claimed limitations of Claims 2 and 10 wherein the A moiety is a pyridine, a quinoline or a pyrimidine further preclude the '750 patent from anticipating these claims.

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Therefore, the Examiner is respectfully requested to withdraw this anticipation rejection as the presently claimed compounds are novel over the '750 patent cited by the Examiner.

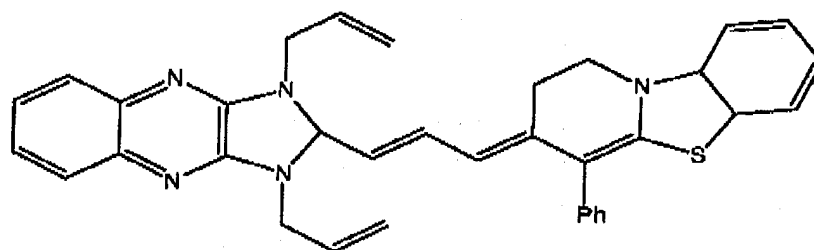
### 35 U.S.C. 103 Rejection

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Heseltine et al (U.S. Patent 4,003,750) as applied to claims 1, 2 and 10.

Claim 4 has been amended to remove "each X is independently O or S" because this was not a further limitation of Claim 2. Claim 2 depends from Claim 1 and X is only claimed to be O or S in Claim 1.

Applicants believe this amendment removes the obviousness rejection of Claim 4. The Examiner is respectfully requested to withdraw this obviousness rejection.

Heseltine teaches a compound having the formula:



(see column 12, example 3, lines 55-end).

This compound meets the claim, since there is an A, which represents the atoms necessary to form two fused aromatic rings having 6 atoms in each ring wherein some of the ring atoms are nitrogen,

Where X is selected from the group consisting of  $\text{NR}^{15}$ , with  $\text{R}^{15}$  being an alkyl group with three carbons,

Where  $\alpha$  is 0 and  $\beta$  is 1 so that  $\alpha + \beta = 1$ ,

Where  $\text{R}^2$  is an alkyl group having three carbons,

Where  $n=1$ ,

Where Y is  $\text{C}=\text{C}$  and  $m+p = 1$

And where the remaining substituents permit the presence of the cyclic substituents and the aromatic ring. In particular,  $\text{R}^3$ ,  $\text{R}^4$ ,  $\text{R}^5$  and  $\text{R}^6$  are all indicated as being permissive of having a cyclic substituent which may have 1-6 carbons, as well as various alkyl groups which may have 1-6 carbons, which may be substituted.

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As demonstrated above, the '750 patent does *not* disclose a compound that falls within the scope of the presently claimed compounds for at least the three reasons detailed above and thus the '750 patent is not equivalent to the present invention. The '750 patent is directed to methine dye compounds comprising a first and second nuclei joined by a methine bridge used as photographic sensitizing dyes wherein a Y or Y' moiety is required. In addition, the Y or Y' moiety comprise a 5-membered ring; 5-membered ring substituents are not contemplated on the right side of the presently claimed compounds. The present invention is directed to aza-benzazolum cyanine dye compounds that structurally fall outside the scope of the '750 patent and that are not functionally equivalent as the present compounds are used to stain nucleic acids and poly(amino acids).

Heseltine does not exemplify, but does expressly suggest that the five membered ring with a nitrogen may include a sulfur or oxygen atom (see column 6, line 54).

Should the Examiner not deem the amendment to Claim 4 adequate to withdraw the obviousness rejection, or agree that the other asserted structural difference preclude the '750 patent from rendering Claim 4 obvious, Applicants would like to further clarify why the '750 patent does not render the presently claimed compounds obvious.

Applicants respectfully assert that the '750 patent does not suggest that the five membered ring of the *aza-benzazolum moiety* include a sulfur or oxygen atom but rather that the '750 patent teaches that the five membered ring of the *benzothiazole moiety* (or Y and Y' moiety) include a sulfur or oxygen atom. As discussed above, the present invention *does not* disclose a benzothiazole moiety or corresponding Y or Y' moiety as a substituent of the pyridinium ring that is directly attached to the methine bridge. Thus, regardless of what the '750 patent teaches in respect to this moiety it is a moot point for the presently claimed compounds because a corresponding Y moiety is absent from the presently claimed compounds.

The presently claimed compounds comprise only one fused 5-membered ring wherein this ring does not share a nitrogen atom with another ring; the present 5-membered ring comprises the aza-benzazolum moiety. Applicants respectfully assert that the language cited by the Examiner is directed to the five membered ring of the Y or Y' moiety which is the *benzothiazole moiety* of the Heseltine compound. The '750 patent

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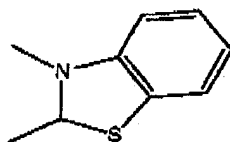
contains no suggestion that the 5-membered ring that corresponds to the 5-membered ring of the aza-benzazolum moiety of the present compounds contain anything other than nitrogen.

The '750 patent discloses "preferably, the groups Y and Y' in Formulas I to VII



have the structure wherein X is a sulfur atom, an oxygen atom..." and "B represents the nonmetallic atoms necessary to complete an aromatic nucleus" (column 6 lines 46-61). Applicants would like to point out that Formula I to Formula VII on column 2:column 3 lines 1-10 comprise a Y or Y' group that is fused to a pyridine ring wherein the pyridine ring is attached to the methine bridge. These formulas demonstrate that the Y or Y' moiety is part of at least a three fused ring structure with the 5-membered ring in the middle. This is because the Y or Y' moiety includes B, which as disclosed above forms an aromatic ring. In all cases, the Y or Y' moiety shares the nitrogen atom of the pyridine ring wherein the methine bridge is directly attached to an aromatic carbon atom of the pyridine moiety.

By way of example, the corresponding Y moiety of the cited Hasetline compound



has the following formula: wherein N is the shared nitrogen of the pyridine and the S represents X of the Y moiety as disclosed in the '750 patent. The X in the '750 patent does not correspond to the X of the presently claimed compounds.

This analysis of Formulas I to VII provides evidence that the Y or Y' moiety and the subsequent 5-membered ring are not equivalent to the 5-membered ring of the aza-benzazolum moiety of the present invention. The Applicants respectfully assert that the '750 patent can in no way be interpreted to teach an oxygen or sulfur atom substitutions at the X position of the presently claimed compounds.

Furthermore, the Y and Y' moieties of the '750 patent are *required* for all of the disclosed compounds whereas a corresponding moiety is not contemplated for the present invention. This is because the Y and Y' moiety forms a fused ring system incorporating the nitrogen atom of the pyridine ring (pyridinium moiety) but as pointed

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out above, the nitrogen substituent of the present invention, R<sup>5</sup>, is not disclosed to form a ring with the adjacent carbon substituent, R<sup>6</sup>.

Thus, the Examiner is respectfully requested to withdraw this obviousness rejection.

It would have been prima facie obvious to one of ordinary skill in the art at the time the invention was made to place a sulfur or oxygen in the ring of Heseltine since Heseltine expressly suggests that in the Y' ring, X can be a "sulfur atom" or an "oxygen atom" (see column 6, line 54). An ordinary practitioner would have been motivated to follow Heseltine's suggestion in order to form a variety of dyes which are useful in photographic emulsions.

Applicants have amended Claim 4, as detailed above, because Claim 1 was amended to only permit O or S substitution at X and the limitation of Claim 4 relating to X was no longer a further limitation of Claim 1. In addition, the ring moiety on the right side of the compound taught by Heseltine is not equivalent to the ring on the right side of the present compounds.

The Examiner is respectfully requested to remove this obviousness rejection.

#### **ALLOWABLE SUBJECT MATTER**

The elected structure and compound are allowable over the prior art and would be allowed if placed into an independent claim.

Previously, Applicants added new claims (Claims 52-65) directed to compounds wherein the aza-benzazolum moiety comprises a pyridine ring as exemplified by formula I on page 4 of the present application. The elected species compound is covered by these claims and dependent Claim 58 specifically covers the elected compound. Applicants believe these subgenus Claims are free of the prior art and are thus choosing not to add a separate independent claim at this time directed to only the elected compound, which the Examiner has stated is patentable over the prior art.

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**CONCLUSION**

In view of the above amendments and remarks, it is submitted that this application is now ready for allowance. Early notice to this effect is solicited. If, in the opinion of the Examiner, a telephone conference would expedite the prosecution of the subject application, the Examiner is invited to call the undersigned agent at (541) 984-5656.

Respectfully submitted,

Date: March 13, 2003

Koren J. Anderson  
Koren J. Anderson Ph.D.  
Reg. No. 51,061

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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Haugland and Yue

Serial No.: 09/557,275

Filed: April 24, 2000

For: **Aza-Benzazolum Containing  
Cyanine Dyes**

Examiner: J. Fredman

Group Art Unit: 1637

**MARKED-UP VERSION OF THE CLAIMS**

Assistant Commissioner for Patents  
U.S. Patent and Trademark Office  
Washington, D.C. 20231

Dear Sir:

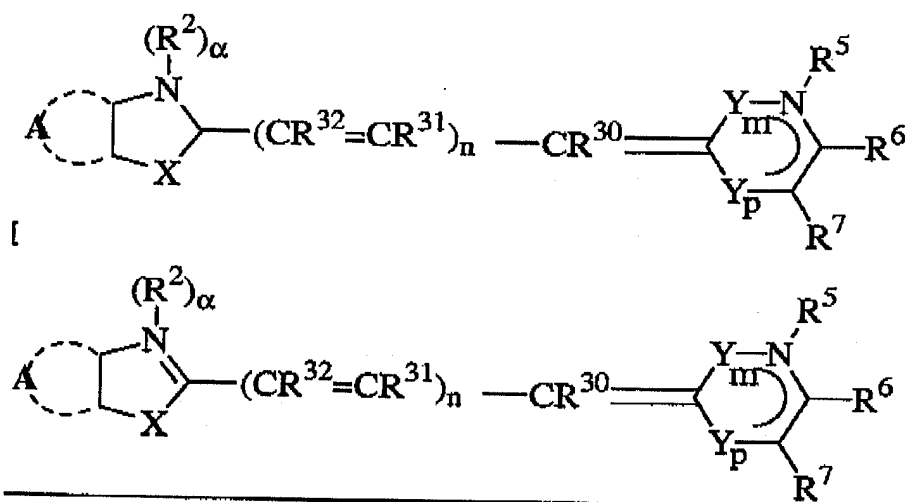
The following Marked-Up Version of the Claims is hereby submitted together with the Response to the Office Action on or before the one-month extended due date of March 20, 2003.

CERTIFICATE OF TRANSMISSION

I HEREBY CERTIFY THAT THIS PAPER AND THE DOCUMENTS REFERRED AS BEING ATTACHED OR ENCLOSED HEREWITH ARE BEING FACSIMILE TRANSMITTED TO THE UNITED STATES PATENT AND TRADEMARK OFFICE ON 3/13/03 TO 1.703.746.5147 By Julie Schenck

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1. (Currently Amended) A compound having formula



wherein A represents the atoms necessary to form one to two fused aromatic rings having 6 atoms in each ring selected from the group consisting of  $-\text{C}-$ ,  $\text{CH}$  or  $\text{N}(\text{R}^2)^\beta$ , provided at least one of said ring atoms is  $\text{N}(\text{R}^2)^\beta$ , wherein aromatic carbon atoms are optionally substituted one or more times by substituents selected from the group consisting of hydrogen, alkyl having from 1-6 carbons, alkoxy having from 1-6 carbons, trifluoromethyl, halogen, methylthio,  $-\text{L}-\text{R}_x$  and  $-\text{L}-\text{S}_o$ ;

X is selected from the group consisting of  $\text{O}[\text{.}]$  and S, [Se,  $\text{NR}^{15}$ , and  $\text{CR}^{16}\text{R}^{17}$  wherein  $\text{R}^{15}$  is hydrogen or an alkyl group having 1-6 carbons and  $\text{R}^{16}$  and  $\text{R}^{17}$  are independently alkyl groups having 1-6 carbons, or  $\text{R}^{16}$  and  $\text{R}^{17}$  taken in combination complete a five or six membered saturated ring];

$\alpha$  is 0 or 1 and  $\beta$  is 0 or 1 provided that  $\alpha + \text{all } \beta = 1$ ;

$\text{R}^2$  is selected from the group consisting of  $-\text{L}-\text{R}_x$ ,  $-\text{L}-\text{S}_o$ , TAIL, BRIDGE and an alkyl group having 1-6 carbons that is optionally substituted by sulfo, carboxy, or amino;

$n = 0, 1$  or  $2$ ;



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Y is  $-CR^3=CR^4-$ ;

p and m = 0 or 1, such that  $p + m = 1$ ;

$R^3$ ,  $R^4$ ,  $R^6$ , and  $R^7$  are independently selected from the group consisting of hydrogen, an alkyl that is saturated or unsaturated, linear or branched, having 1-6 carbons, a halogen, a CYCLIC SUBSTITUENT,  $-OR^8$ ,  $-SR^8$ ,  $-(NR^8R^9)$ , TAIL, BRIDGE,  $-L-R_x$  and  $-L-S_c$  wherein  $R^8$  and  $R^9$  are independently alkyl groups having 1-6 carbons or 1-2 alicyclic or aromatic rings; or  $R^8$  and  $R^9$  taken in combination are  $-(CH_2)_2-W-(CH_2)_2-$  where W is a single bond,  $-O-$ ,  $-CH_2-$ , or  $-NR^{10}-$ , where  $R^{10}$  is H or an alkyl having 1-6 carbons;

or  $R^6$  and  $R^7$  taken in combination form a fused 6-membered aromatic ring wherein ring substituents  $R^{11}$ ,  $R^{12}$ ,  $R^{13}$ , and  $R^{14}$  are independently selected from the group consisting of hydrogen, halogen,  $-OR^8$ ,  $-SR^8$ ,  $-(NR^8R^9)$  a CYCLIC SUBSTITUENT, TAIL, BRIDGE,  $-L-R_x$ ,  $-L-S_c$  and a saturated or unsaturated alkyl having 1-6 carbons that is linear or branched;

$R^5$  is selected from the group consisting of CYCLIC SUBSTITUENT, TAIL, BRIDGE,  $-L-R_x$ ,  $-L-S_c$ , a pair of electrons, sulfoalkyl and a saturated or unsaturated alkyl having 1-6 carbons that is linear or branched;

$R^{30}$ ,  $R^{31}$ , and  $R^{32}$  are independently selected from the group consisting of hydrogen, alkyl having 1-6 carbons, cycloalkyl having 3-10 carbons, aryl, and heteroaryl; and,

when present, BRIDGE is attached to a DYE compound provided that no more than one of  $R^2$ ,  $R^3$ ,  $R^4$ ,  $R^5$ ,  $R^6$ ,  $R^7$ ,  $R^{11}$ ,  $R^{12}$ ,  $R^{13}$ ,  $R^{14}$  and  $R^{15}$  is BRIDGE;

wherein

L and BRIDGE are independently a single covalent bond or a covalent linkage having 1-20 nonhydrogen atoms selected from the group consisting of C, N, O and S;

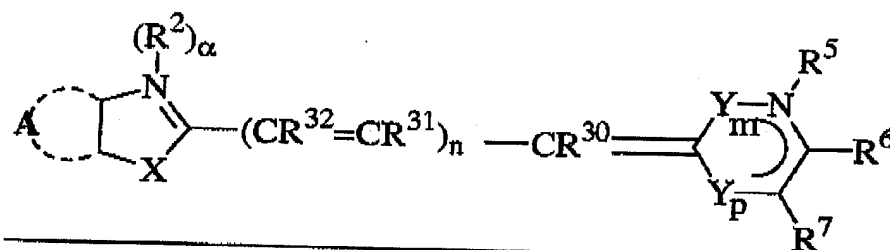
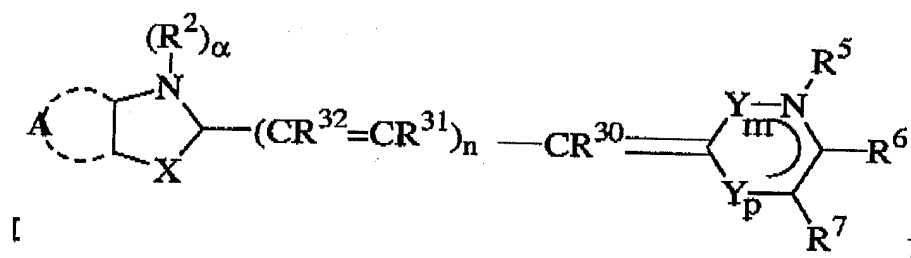
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$R_x$  is a reactive group;

$S_c$  is a conjugated substance;

TAIL is a heteroatom-containing moiety;

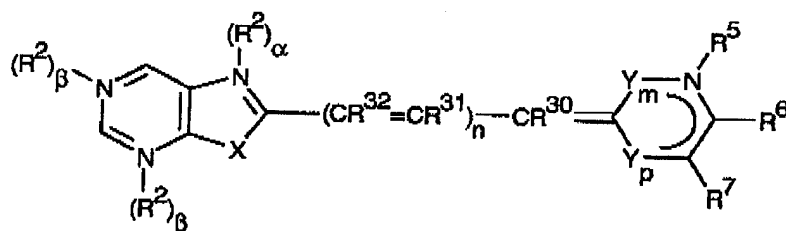
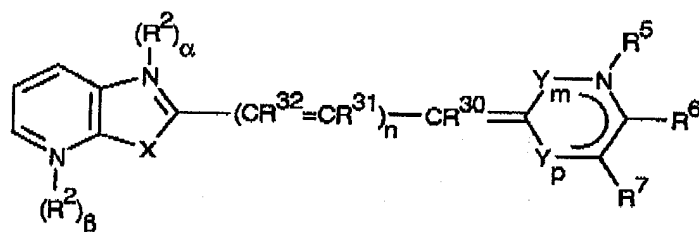
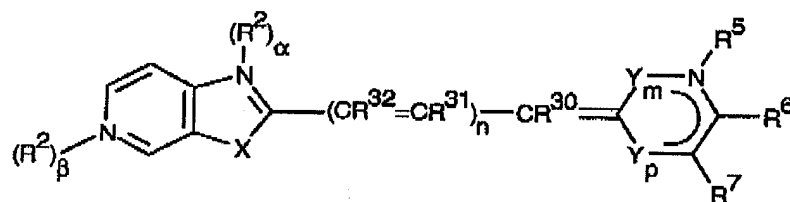
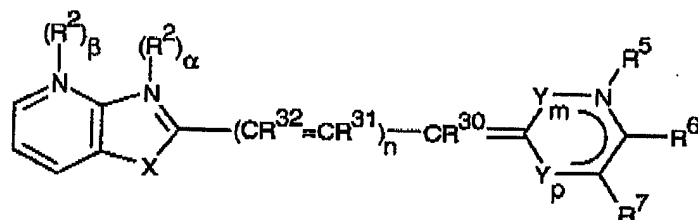
DYE is a compound having formula



wherein A, X,  $R^2$ ,  $\alpha$ , n,  $Y_m$ ,  $Y_p$ ,  $R^5$ ,  $R^6$ ,  $R^7$ ,  $R^{30}$ ,  $R^{31}$  and  $R^{32}$  are as defined above provided that BRIDGE not be any of  $R^2$ ,  $R^8$ ,  $R^4$ ,  $R^5$ ,  $R^6$ ,  $R^7$ ,  $R^{11}$ ,  $R^{12}$ ,  $R^{13}$ ,  $R^{14}$  and  $R^{15}$ .

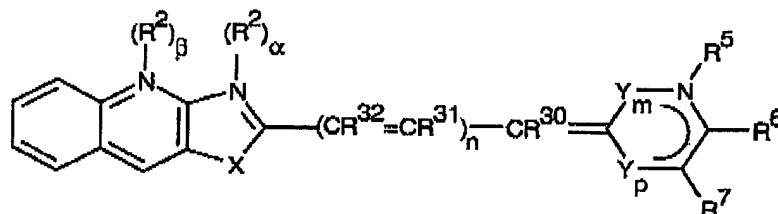
2. (Previously Amended) The compound according to Claim 1, having the formula selected from the group consisting of

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and

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3. (Previously Amended) The compound according to Claim 1, wherein said TAIL comprises formula LINK-SPACER-CAP;

wherein

LINK is a single covalent bond, -O-, -S-, or -NR<sup>20</sup>-; where R<sup>20</sup> is hydrogen, a linear or branched alkyl having 1-8 carbons, or -SPACER'-CAP';

SPACER and SPACER' are individually covalent linkages that are linear or branched, cyclic or heterocyclic, saturated or unsaturated, having 1-16 nonhydrogen atoms selected from the group consisting of C, N, P, O and S;

CAP and CAP' are individually -O-R<sup>21</sup>, -S-R<sup>21</sup>, -NR<sup>21</sup>R<sup>22</sup>, or -N<sup>+</sup>R<sup>21</sup>R<sup>22</sup>R<sup>23</sup>Ψ<sup>-</sup>;

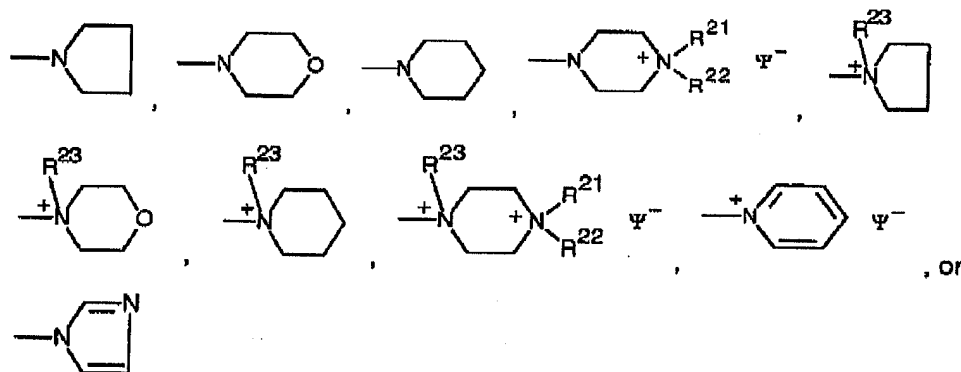
wherein

R<sup>21</sup>, R<sup>22</sup>, and R<sup>23</sup> are independently hydrogen or a linear or branched alkyl having 1-6 carbons or cycloalkyl having 3-8 carbons, wherein said alkyl is optionally further substituted by substituents selected from the group consisting of halogen, hydroxy, alkoxy having 1-8 carbons, amino, carboxy, sulfo and phenyl, wherein said phenyl is optionally further substituted by substituents selected from the group consisting of halogen, hydroxy, alkoxy having 1-8 carbons, aminoalkyl having 1-8 carbons, sulfoalkyl and carboxyalkyl having 1-8 carbons; or one or more of R<sup>21</sup>, R<sup>22</sup> and R<sup>23</sup>, taken in combination with SPACER and R<sup>20</sup> or SPACER alone forms a 5- or 6-membered aromatic, heteroaromatic, alicyclic or heteroalicyclic ring, the heteroatoms selected from O, N or S; where Ψ<sup>-</sup> is a compatible counterion;

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or

CAP and CAP' are independently



4. (Currently Amended) The compound according to Claim 2, wherein each R<sup>2</sup> is independently ethyl or methyl, [each X is independently O or S,] each n is independently 0 or 1, and R<sup>30</sup>, R<sup>31</sup>, and R<sup>32</sup> are each hydrogen.

5. (Previously Amended) The compound according to Claim 2, wherein at least one R<sup>3</sup>, R<sup>4</sup>, R<sup>5</sup>, R<sup>6</sup>, R<sup>7</sup>, R<sup>11</sup>, R<sup>12</sup>, R<sup>13</sup>, and R<sup>14</sup> is a CYCLIC SUBSTITUENT selected from the group consisting of aryl, heteroaryl, and cycloalkyl having 3-10 carbons wherein said CYCLIC SUBSTITUENT is individually and optionally substituted by TAIL, halogen, amino, or an alkyl containing moiety comprising 1-6 carbons.

6. (Previously Amended) The compound according to Claim 3, wherein said TAIL comprises LINK that is a single covalent bond or NR<sup>20</sup> wherein R<sup>20</sup> is hydrogen or an alkyl; SAPCER and SPACER' that are independently a linear alkyl having 1-8 carbons or a 6-membered carbon ring; CAP and CAP' that are individually -NR<sup>21</sup>R<sup>22</sup>, or -N<sup>+</sup>R<sup>21</sup>R<sup>22</sup>R<sup>23</sup>  $\Psi^-$ , wherein R<sup>21</sup>, R<sup>22</sup>, and R<sup>23</sup> are independently hydrogen, alkyl or cycloalkyl.

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7. (Previously Amended) The compound according to Claim 6, wherein  $R^4$  is a TAIL or BRIDGE.

8. (Previously Amended) The compound according to Claim 6, wherein  $R^5$  is a TAIL, a CYCLIC SUBSTITUENT, or BRIDGE.

9. (Previously Amended) The compound according to Claim 8, wherein  $R^5$  is a TAIL or a BRIDGE wherein TAIL and BRIDGE incorporate at least one quaternary nitrogen atom.

10. (Previously Amended) The compound according to Claim 2, wherein each  $R^3$ ,  $R^{11}$ ,  $R^{12}$ ,  $R^{13}$  and  $R^{14}$  is hydrogen.

11. (Previously Amended) The compound according to Claim 3, wherein

$R^5$  is an alkyl and

$R^4$  is selected from the group consisting of halogen, CYCLIC SUBSTITUENT,  $-OR^8$ ,  $-SR^8$ ,  $-(NR^8R^9)$ , TAIL, BRIDGE,  $-L-R_x$ , and  $-L-S_o$ .

12. (Previously Amended) The compound according to Claim 1, wherein  $S_o$  is selected from the group consisting of an amino acid, a peptide, a protein, a polysaccharide, a nucleotide, an oligonucleotide, a nucleic acid, a lipid, a polymeric microparticle, a biological cell, a DNA-binding protein and a virus.

13. (Previously Amended) The compound according to Claim 12, wherein  $S_o$  is an oligonucleotide, a nucleic acid, or a DNA-binding protein.

14. (Previously Amended) The compound according to Claim 6, wherein

each X is O;

each n is independently = 0, 1, or 2;

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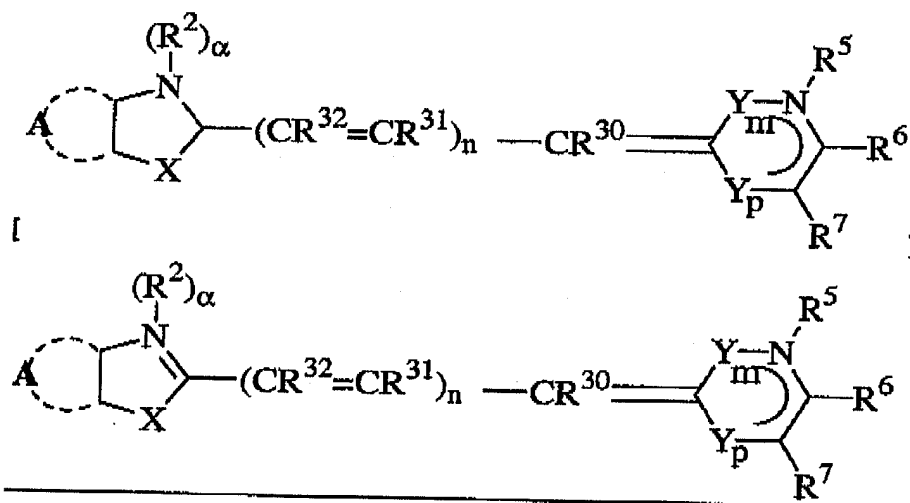
each  $m = 1$ ;

each  $R^{30}$ ,  $R^{31}$ , and  $R^{32}$  are H; and

$R^5$  is selected from the group consisting of an alkyl, a TAIL, a CYCLIC SUBSTITUENT, and a BRIDGE.

15. (Currently Amended) A complex comprising:

a) a compound having formula



wherein A represents the atoms necessary to form one to two fused aromatic rings having 6 atoms in each ring selected from the group consisting of  $-C-$ ,  $CH$  or  $N(R^2)^5$ , provided at least one of said ring atoms is  $N(R^2)^5$  wherein aromatic carbons are optionally substituted one or more times by substituents selected from the group consisting of hydrogen, alkyl having from 1-6 carbons, alkoxy having from 1-6 carbons, trifluoromethyl, halogen, methylthio,  $-L-R_x$  and  $-L-S_c$ ;

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X is selected from the group consisting of O[,], and S[,], Se, NR<sup>15</sup>, and CR<sup>16</sup>R<sup>17</sup> wherein R<sup>15</sup> is hydrogen or an alkyl group having 1-6 carbons and R<sup>16</sup> and R<sup>17</sup> are independently alkyl groups having 1-6 carbons, or R<sup>16</sup> and R<sup>17</sup> taken in combination complete a five or six membered saturated ring];

$\alpha$  is 0 or 1 and  $\beta$  is 0 or 1 provided that  $\alpha + \beta = 1$ ;

R<sup>2</sup> is selected from the group consisting of -L-R<sub>x</sub>, -L-S<sub>o</sub>, TAIL, BRIDGE and an alkyl group having 1-6 carbons that is optionally substituted by sulfo, carboxy, or amino;

n = 0, 1 or 2;

Y is -CR<sup>3</sup>=CR<sup>4</sup>-;

p and m = 0 or 1, such that p + m = 1;

R<sup>3</sup>, R<sup>4</sup>, R<sup>6</sup>, and R<sup>7</sup> are independently selected from the group consisting of hydrogen, an alkyl that is saturated or unsaturated, linear or branched, having 1-6 carbons, a halogen, a CYCLIC SUBSTITUENT, -OR<sup>8</sup>, -SR<sup>8</sup>, -(NR<sup>8</sup>R<sup>9</sup>), TAIL, BRIDGE, -L-R<sub>x</sub> and -L-S<sub>o</sub> wherein R<sup>8</sup> and R<sup>9</sup> are independently alkyl groups having 1-6 carbons or 1-2 alicyclic or aromatic rings; or R<sup>8</sup> and R<sup>9</sup> taken in combination are -(CH<sub>2</sub>)<sub>2</sub>-W-(CH<sub>2</sub>)<sub>2</sub>- where W is a single bond, -O-, -CH<sub>2</sub>-, or -NR<sup>10</sup>-, where R<sup>10</sup> is H or an alkyl having 1-6 carbons;

or R<sup>6</sup> and R<sup>7</sup> taken in combination form a fused 6-membered aromatic ring wherein ring substituents R<sup>11</sup>, R<sup>12</sup>, R<sup>13</sup>, and R<sup>14</sup> are independently selected from the group consisting of hydrogen, halogen, -OR<sup>8</sup>, -SR<sup>8</sup>, -(NR<sup>8</sup>R<sup>9</sup>) a CYCLIC SUBSTITUENT, TAIL, BRIDGE, -L-R<sub>x</sub>, -L-S<sub>o</sub> and a saturated or unsaturated alkyl having 1-6 carbons that is linear or branched;

R<sup>5</sup> is selected from the group consisting of CYCLIC SUBSTITUENT, TAIL, BRIDGE, -L-R<sub>x</sub>, -L-S<sub>o</sub>, a pair of electrons, sulfoalkyl and a saturated or unsaturated alkyl having 1-6



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carbons that is linear or branched;

$R^{30}$ ,  $R^{31}$ , and  $R^{32}$  are independently selected from the group consisting of hydrogen alkyl having 1-6 carbons, cycloalkyl having 3-10 carbons, aryl, and heteroaryl; and,

when present, BRIDGE is attached to a DYE compound provided that no more than one of  $R^2$ ,  $R^3$ ,  $R^4$ ,  $R^5$ ,  $R^6$ ,  $R^7$ ,  $R^{11}$ ,  $R^{12}$ ,  $R^{13}$ ,  $R^{14}$  and  $R^{15}$  is BRIDGE;

wherein

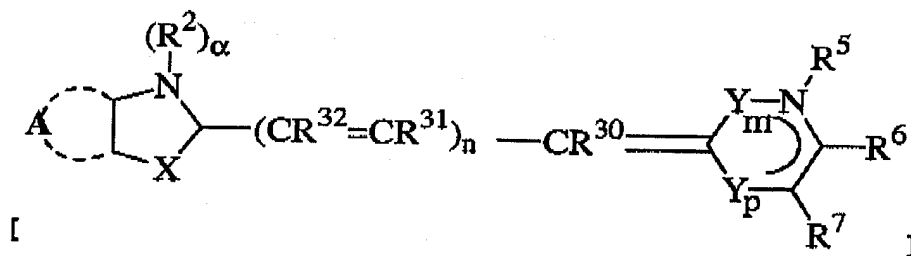
L and BRIDGE are independently a single covalent bond or a covalent linkage having 1-20 nonhydrogen atoms selected from the group consisting of C, N, O and S;

$R_x$  is a reactive group;

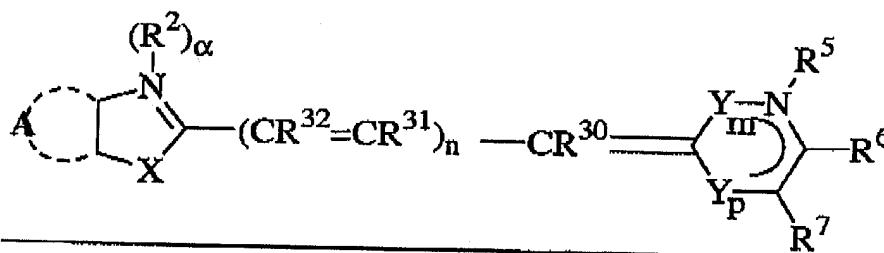
$S_c$  is a conjugated substance;

TAIL is a heteroatom-containing moiety;

DYE is a compound having formula



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wherein A, X, R<sup>2</sup>,  $\alpha$ , n, Y<sub>m</sub>, Y<sub>p</sub>, R<sup>5</sup>, R<sup>6</sup>, R<sup>7</sup>, R<sup>30</sup>, R<sup>31</sup> and R<sup>32</sup> are as defined above provided that BRIDGE not be any of R<sup>2</sup>, R<sup>3</sup>, R<sup>4</sup>, R<sup>5</sup>, R<sup>6</sup>, R<sup>7</sup>, R<sup>11</sup>, R<sup>12</sup>, R<sup>13</sup>, R<sup>14</sup> and R<sup>15</sup>; and

b) a nucleic acid polymer.

16. (Previously Amended) The complex according to Claim 15, wherein said nucleic acid polymer is a chromosome or fragment thereof, or a natural or synthetic oligonucleotide.

17. (Cancelled)

18. (Previously Amended) The complex according to Claim 16, wherein said nucleic acid is enclosed in a biological structure, free in solution, immobilized on a solid or semi-solid material or is extracted from a biological structure.

19. (Previously Amended) The complex according to Claim 18, wherein said complex is enclosed in a biological structure present in a solution or on an inert matrix.

20. (Previously Amended) The complex according to Claim 19 or 21, wherein said complex is enclosed in a biological structure.

21. (Previously Amended) The complex according to Claim 18, wherein said biological structure is a cell and said cell is undergoing apoptosis, necrosis, or is in a cycle of cell division.

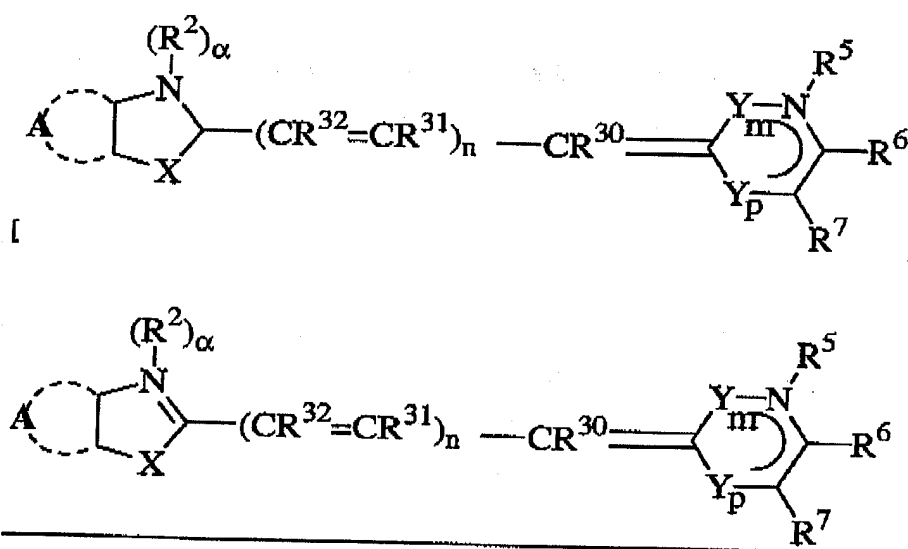
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22. (Previously Amended) The complex according to Claim 15, wherein at least one compound is substituted by  $-L-S_c$  wherein  $S_c$  is selected from the group consisting of hapten, nucleotide, oligonucleotide, nucleic acid polymer, protein, polysaccharide and DNA binding protein.

23. (Cancelled)

24. (Currently Amended) A complex comprising:

a) a compound having formula:



wherein A represents the atoms necessary to form one to two fused aromatic rings having 6 atoms in each ring selected from the group consisting of  $-C-$ ,  $CH$  or  $N(R^2)^\beta$ , provided at least one of said ring atoms is  $N(R^2)^\beta$  wherein aromatic carbons are optionally substituted one or more times by substituents selected from the group consisting of hydrogen, alkyl having from 1-6 carbons, alkoxy having from 1-6 carbons, trifluoromethyl, halogen, methylthio,  $-L-R_x$  and  $-L-S_c$ ;

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X is selected from the group consisting of O[,] and S[, Se, NR<sup>15</sup>, and CR<sup>16</sup>R<sup>17</sup> wherein R<sup>15</sup> is H or an alkyl group having 1-6 carbons and R<sup>16</sup> and R<sup>17</sup> are independently alkyl groups having 1-6 carbons, or R<sup>16</sup> and R<sup>17</sup> taken in combination complete a five or six membered saturated ring];

$\alpha$  is 0 or 1 and  $\beta$  is 0 or 1 provided that  $\alpha + \text{all } \beta = 1$ ;

R<sup>2</sup> is selected from the group consisting of -L-R<sub>x</sub>, -L-S<sub>o</sub>, TAIL, BRIDGE and an alkyl group having 1-6 carbons that is optionally substituted by sulfo, carboxy, or amino;

n = 0, 1 or 2;

Y is -CR<sup>3</sup>=CR<sup>4</sup>-;

p and m = 0 or 1, such that p + m = 1;

R<sup>3</sup>, R<sup>4</sup>, R<sup>6</sup>, and R<sup>7</sup> are independently selected from the group consisting of hydrogen, an alkyl that is saturated or unsaturated, linear or branched, having 1-6 carbons, a halogen, a CYCLIC SUBSTITUENT, -OR<sup>8</sup>, -SR<sup>8</sup>, -(NR<sup>8</sup>R<sup>9</sup>), TAIL, BRIDGE, -L-R<sub>x</sub> and -L-S<sub>o</sub> wherein R<sup>8</sup> and R<sup>9</sup> are independently alkyl groups having 1-6 carbons or 1-2 alicyclic or aromatic rings; or R<sup>8</sup> and R<sup>9</sup> taken in combination are -(CH<sub>2</sub>)<sub>2</sub>-W-(CH<sub>2</sub>)<sub>2</sub>- where W is a single bond, -O-, -CH<sub>2</sub>-, or -NR<sup>10</sup>-, where R<sup>10</sup> is H or an alkyl having 1-6 carbons;

or R<sup>6</sup> and R<sup>7</sup> taken in combination form a fused 6-membered aromatic ring wherein ring substituents R<sup>11</sup>, R<sup>12</sup>, R<sup>13</sup>, and R<sup>14</sup> are independently selected from the group consisting of hydrogen, halogen, -OR<sup>8</sup>, -SR<sup>8</sup>, -(NR<sup>8</sup>R<sup>9</sup>) a CYCLIC SUBSTITUENT, TAIL, BRIDGE, -L-R<sub>x</sub>, -L-S<sub>o</sub> and a saturated or unsaturated alkyl having 1-6 carbons that is linear or branched;

R<sup>5</sup> is selected from the group consisting of CYCLIC SUBSTITUENT, TAIL, BRIDGE, -L-R<sub>x</sub>, -L-S<sub>o</sub>, a pair of electrons, sulfoalkyl and a saturated or unsaturated alkyl having 1-6 carbons that is linear or branched;

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$R^{30}$ ,  $R^{31}$ , and  $R^{32}$  are independently selected from the group consisting of hydrogen, alkyl having 1-6 carbons, cycloalkyl having 3-10 carbons, aryl, and heteroaryl; and,

when present, BRIDGE is attached to a DYE compound provided that no more than one of  $R^2$ ,  $R^3$ ,  $R^4$ ,  $R^5$ ,  $R^6$ ,  $R^7$ ,  $R^{11}$ ,  $R^{12}$ ,  $R^{13}$ ,  $R^{14}$  and  $R^{15}$  is BRIDGE;

wherein

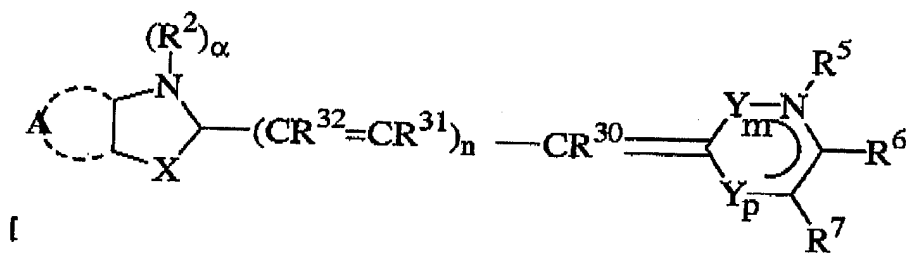
L and BRIDGE are independently a single covalent bond or a covalent linkage having 1-20 nonhydrogen atoms selected from the group consisting of C, N, O and S;

$R_x$  is a reactive group;

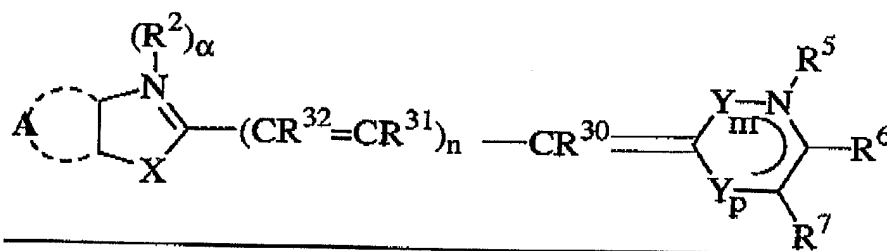
$S_o$  is a conjugated substance;

TAIL is a heteroatom-containing moiety;

DYE is a compound having formula



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wherein A, X, R<sup>2</sup>,  $\alpha$ , n, Y<sub>m</sub>, Y<sub>p</sub>, R<sup>5</sup>, R<sup>6</sup>, R<sup>7</sup>, R<sup>30</sup>, R<sup>31</sup> and R<sup>32</sup> are as defined above provided that BRIDGE not be any of R<sup>2</sup>, R<sup>3</sup>, R<sup>4</sup>, R<sup>5</sup>, R<sup>6</sup>, R<sup>7</sup>, R<sup>11</sup>, R<sup>12</sup>, R<sup>13</sup>, R<sup>14</sup> and R<sup>15</sup>; and,

b) a poly(amino acid).

25. (Previously Amended) The complex according to Claim 51, where said detergent is an alkyl sulfate or alkyl sulfonate salt.

26. (Previously Amended) The complex according to Claim 25, wherein said poly(amino acids) are present on or in a solid or semi-solid matrix.

27. (Previously Amended) The complex according to Claim 26, wherein said matrix is a membrane or an electrophoretic gel.

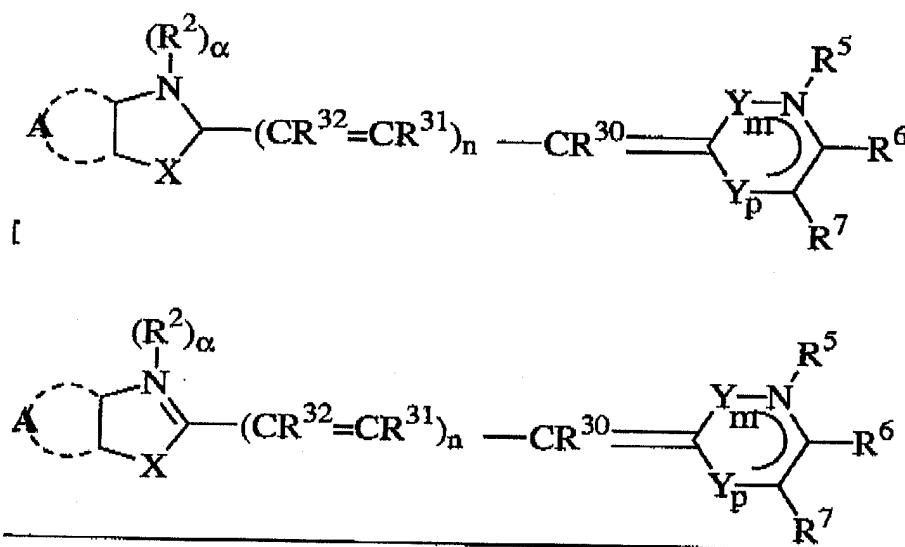
Claims 28-43. (Withdrawn)

44. (Currently Amended) A kit comprising:

a) a stock solution comprising;

i) one or more compounds individually having formula:

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wherein A represents the atoms necessary to form one to two fused aromatic rings having 6 atoms in each ring selected from the group consisting of  $-C-$ ,  $CH$  or  $N(R^2)^\beta$ , provided at least one of said ring atoms is  $N(R^2)^\beta$  wherein aromatic carbons are optionally substituted one or more times by substituents selected from the group consisting of hydrogen, alkyl having from 1-6 carbons, alkoxy having from 1-6 carbons, trifluoromethyl, halogen, methylthio,  $-L-R_x$  and  $-L-S_x$ ;

X is selected from the group consisting of  $O[.]$  and  $S[.]$ ,  $Se$ ,  $NR^{15}$ , and  $CR^{16}R^{17}$  wherein  $R^{15}$  is hydrogen or an alkyl group having 1-6 carbons and  $R^{16}$  and  $R^{17}$  are independently alkyl groups having 1-6 carbons, or  $R^{16}$  and  $R^{17}$  taken in combination complete a five or six membered saturated ring);

$\alpha$  is 0 or 1 and  $\beta$  is 0 or 1 provided that  $\alpha + \text{all } \beta = 1$ ;

$R^2$  is selected from the group consisting of  $-L-R_x$ ,  $-L-S_x$ , TAIL, BRIDGE and an alkyl group having 1-6 carbons that is optionally substituted by sulfo, carboxy, or amino;

$n = 0, 1$  or  $2$ ;

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Y is  $-CR^3=CR^4-$ ;

p and m = 0 or 1, such that  $p + m = 1$ ;

$R^3$ ,  $R^4$ ,  $R^6$ , and  $R^7$  are independently selected from the group consisting of hydrogen, an alkyl that is saturated or unsaturated, linear or branched, having 1-6 carbons, a halogen, a CYCLIC SUBSTITUENT,  $-OR^8$ ,  $-SR^8$ ,  $-(NR^8R^9)$ , TAIL, BRIDGE,  $-L-R_x$  and  $-L-S_o$  wherein  $R^8$  and  $R^9$  are independently alkyl groups having 1-6 carbons or 1-2 alicyclic or aromatic rings; or  $R^8$  and  $R^9$  taken in combination are  $-(CH_2)_2-W-(CH_2)_2-$  where W is a single bond,  $-O-$ ,  $-CH_2-$ , or  $-NR^{10}-$ , where  $R^{10}$  is H or an alkyl having 1-6 carbons;

or  $R^6$  and  $R^7$  taken in combination form a fused 6-membered aromatic ring wherein ring substituents  $R^{11}$ ,  $R^{12}$ ,  $R^{13}$ , and  $R^{14}$  are independently selected from the group consisting of hydrogen, halogen,  $-OR^8$ ,  $-SR^8$ ,  $-(NR^8R^9)$  a CYCLIC SUBSTITUENT, TAIL, BRIDGE,  $-L-R_x$ ,  $-L-S_o$  and a saturated or unsaturated alkyl having 1-6 carbons that is linear or branched;

$R^5$  is selected from the group consisting of CYCLIC SUBSTITUENT, TAIL, BRIDGE,  $-L-R_x$ ,  $-L-S_o$ , a pair of electrons, sulfoalkyl and a saturated or unsaturated alkyl having 1-6 carbons that is linear or branched;

$R^{30}$ ,  $R^{31}$ , and  $R^{32}$  are independently selected from the group consisting of H, alkyl having 1-6 carbons, cycloalkyl having 3-10 carbons, aryl, and heteroaryl; and,

when present, BRIDGE is attached to a DYE compound provided that no more than one of  $R^2$ ,  $R^3$ ,  $R^4$ ,  $R^5$ ,  $R^6$ ,  $R^7$ ,  $R^{11}$ ,  $R^{12}$ ,  $R^{13}$ ,  $R^{14}$  and  $R^{15}$  is BRIDGE;

wherein

L and BRIDGE are independently a single covalent bond or a covalent linkage having 1-20 nonhydrogen atoms selected from the group consisting of C, N, O and S;



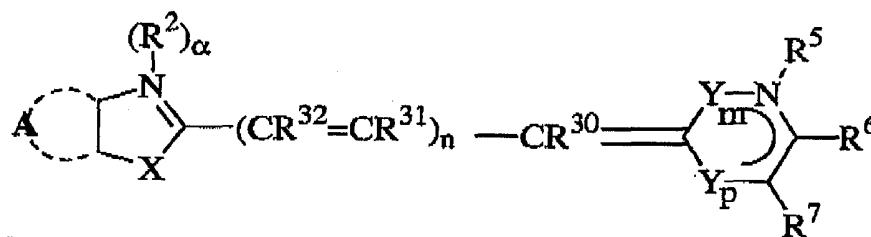
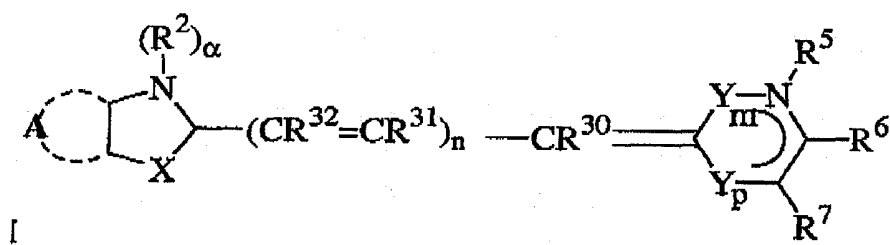
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$R_x$  is a reactive group;

$S_c$  is a conjugated substance;

TAIL is a heteroatom-containing moiety;

DYE is a compound having formula



wherein A, X,  $R^2$ ,  $\alpha$ , n,  $Y_m$ ,  $Y_p$ ,  $R^5$ ,  $R^6$ ,  $R^7$ ,  $R^{30}$ ,  $R^{31}$  and  $R^{32}$  are as defined above provided that BRIDGE not be any of  $R^2$ ,  $R^3$ ,  $R^4$ ,  $R^5$ ,  $R^6$ ,  $R^7$ ,  $R^{11}$ ,  $R^{12}$ ,  $R^{13}$ ,  $R^{14}$  and  $R^{15}$ ;

ii) an organic solvent; and,

b) a buffer suitable for dilution of said stock solution.

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45. (Cancelled)

46. (Previously Amended) The kit according to Claim 44, further comprising a standard, an additional detection reagent, a silicon chip, a glass slide, or any combination thereof.

47. (Previously Amended) The kit according to Claim 46, wherein said additional detection reagent is selected from the group consisting of an organelle stain, a labeled immunoreagent, a drug, and an enzyme.

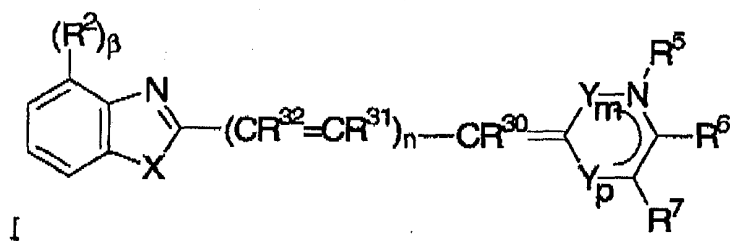
48. (Previously Added) The kit according to Claim 47, wherein said  $R^5$  is BRIDGE that is attached to said DYE.

49. (Previously Added) The kit according to Claim 47, wherein said kit comprises two to six individual said compounds.

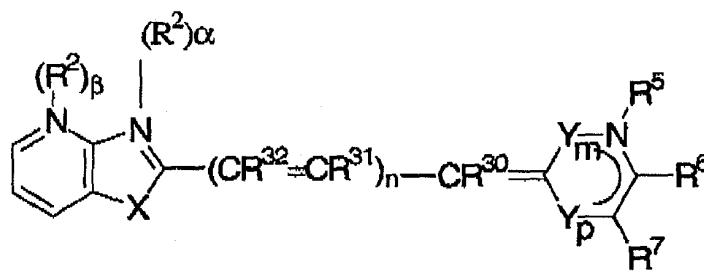
50. (Previously Added) The kit according to any one of claims Claim 47, 48 or 49, wherein said organic solvent is DMSO.

51. (Previously Added) The complex according to Claim 24, wherein said complex further comprises a detergent.

52. (Currently Amended) A compound having formula:



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wherein  $R^2$  is an alkyl having 1-6 carbon atoms and wherein meta and ortho positions to  $R^2$  are independently and optionally substituted with halogen or an alkyl having 1-6 carbons atoms;

X is selected from the group consisting of O[,], and S[, Se,  $NR^{15}$ , and  $CR^{16}R^{17}$  wherein  $R^{15}$  is H or an alkyl group having 1-6 carbons and  $R^{16}$  and  $R^{17}$  are independently alkyl groups having 1-6 carbons];

$n = 0, 1$  or  $2$ ;

$[\beta = 1]$   $\alpha$  is 0 or 1 and  $\beta$  is 0 or 1 provided that  $\alpha + \text{all } \beta = 1$ ;

Y is  $-CR^3=CR^4-$ ;

p and m = 0 or 1, such that  $p + m = 1$ ;

$R^3$ ,  $R^4$ ,  $R^6$ , and  $R^7$  are independently selected from the group consisting of hydrogen, an alkyl having 1-6 carbons, a halogen, a CYCLIC SUBSTITUENT,  $-OR^8$ ,  $-SR^8$ ,  $-(NR^8R^9)$ , TAIL and BRIDGE wherein  $R^8$  and  $R^9$  are independently alkyl groups having 1-6 carbons or 1-2 alicyclic or aromatic rings; or  $R^8$  and  $R^9$  taken in combination are

$-(CH_2)_2-W-(CH_2)_2-$  where W is a single bond,  $-O-$ ,  $-CH_2-$ , or  $-NR^{10}-$ , where  $R^{10}$  is H or an alkyl having 1-6 carbons;

or  $R^6$  and  $R^7$  taken in combination form a fused 6-membered aromatic ring wherein ring substituents  $R^{11}$ ,  $R^{12}$ ,  $R^{13}$ , and  $R^{14}$  are independently selected from the group consisting of hydrogen, halogen,  $-OR^8$ ,  $-SR^8$ ,  $-(NR^8R^9)$ , CYCLIC SUBSTITUENT, TAIL, BRIDGE,

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and an alkyl having 1-6 carbons;

R<sup>5</sup> is selected from the group consisting of CYCLIC SUBSTITUENT, TAIL, BRIDGE, a pair of electrons, sulfoalkyl and an alkyl having 1-6 carbons;

R<sup>30</sup>, R<sup>31</sup>, and R<sup>32</sup> are independently selected from the group consisting of H, alkyl having 1-6 carbons, cycloalkyl having 3-10 carbons, aryl, and heteroaryl; and,

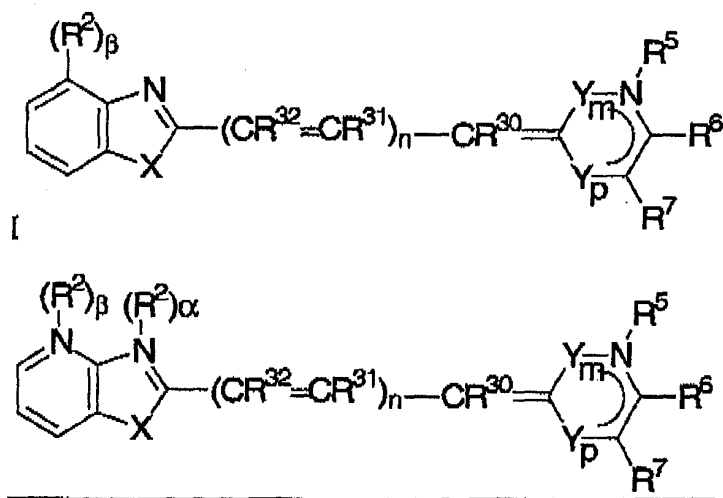
when present, BRIDGE is attached to a DYE compound provided that no more than one of R<sup>3</sup>, R<sup>4</sup>, R<sup>5</sup>, R<sup>6</sup>, R<sup>7</sup>, R<sup>11</sup>, R<sup>12</sup>, R<sup>13</sup> and R<sup>14</sup> is BRIDGE;

wherein;

BRIDGE is independently a single covalent bond or a covalent linkage having 1-20 nonhydrogen atoms selected from the group consisting of C, N, O and S;

TAIL is a heteroatom-containing moiety;

DYE is a compound of the formula



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wherein X,  $R^2$ ,  $\alpha$ ,  $\beta$ , n,  $Y_m$ ,  $Y_p$ ,  $R^5$ ,  $R^6$ ,  $R^7$ ,  $R^{30}$ ,  $R^{31}$  and  $R^{32}$  are as defined above provided that BRIDGE not be any of  $R^3$ ,  $R^4$ ,  $R^5$ ,  $R^6$ ,  $R^7$ ,  $R^{11}$ ,  $R^{12}$ ,  $R^{13}$  and  $R^{14}$ .

53. (Currently Amended) The compound according to Claim 52, wherein

$R^2$  is methyl; said meta and ortho positions are optionally substituted by halogen; [X is S or O;]  $n = 0$ ;  $m = 1$ ;

$R^3$  and  $R^4$  are independently selected from the group consisting of H, alkyl, CYCLIC SUBSTITUENT and TAIL;

$R^6$  and  $R^7$  taken in combination form a fused 6-membered aromatic ring wherein ring substituents  $R^{11}$ ,  $R^{12}$ ,  $R^{13}$ , and  $R^{14}$  are independently hydrogen,  $-OR^8$ , or an alkyl having 1-6 carbons wherein  $R^8$  is methyl;

$R^5$  is selected from the group consisting of CYCLIC SUBSTITUENT, TAIL, BRIDGE, a pair of electrons, and methyl;

$R^{30}$  is hydrogen.

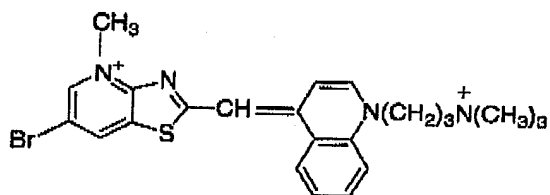
54. (Previously Added) The compound according to Claim 53, wherein X is S, said halogen is chlorine or bromine,  $R^3$  is hydrogen,  $R^4$  is hydrogen or an alkyl and  $R^5$  is selected from the group consisting of methyl, CYCLIC SUBSTITUENT, BRIDGE and TAIL wherein said CYCLIC SUBSTITUENT is an unsubstituted aryl and TAIL comprises formula  $-(CH_2)_3N(CH_3)_3$ .

55. (Previously Added) The compound according to Claim 54 or 53, wherein said  $R^5$  is BRIDGE comprising formula  $-(CH_2)_3N(CH_3)CH_2-$ .

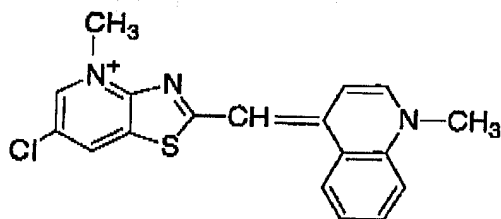
56. (Previously Added) The compound according to any one of Claims 55, 54 or 53, wherein said BRIDGE is attached to said DYE.

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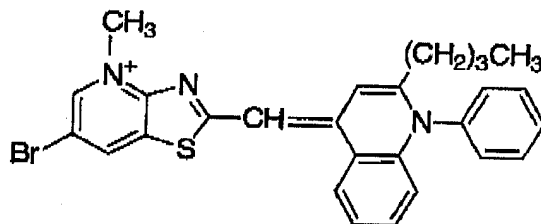
57. (Previously Added) The compound according to Claim 54, wherein said compound has the formula:



58. (Previously Added) The compound according to Claim 54, wherein said compound has the formula:



59. (Previously Added) The compound according to Claim 54, wherein said compound has the formula:

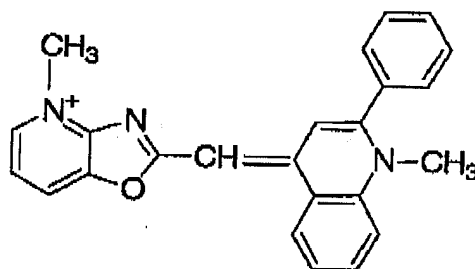


60. (Previously Added) The compound according to Claim 53, wherein X is O; R<sup>3</sup> is hydrogen; R<sup>4</sup> is selected from the group consisting of hydrogen, CYCLIC SUBSTITUENT, TAIL and an alkyl; R<sup>5</sup> is selected from the group consisting of methyl, CYCLIC SUBSTITUENT, BRIDGE and TAIL wherein said CYCLIC SUBSTITUENT is an

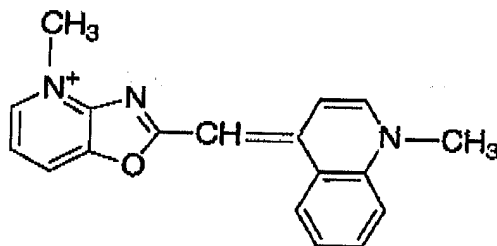
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unsubstituted aryl and said TAIL comprises LINK that is a single covalent bond, SPACER that is a phenyl ring and CAP comprising formula  $-(CH)_2N^+CH_3(CH_2CH_3)_2$ ;  $R^{11}$ ,  $R^{12}$ ,  $R^{13}$ , and  $R^{14}$  are individually hydrogen or  $-OCH_3$ .

61. (Previously Added) The compound according to Claim 60, wherein said compound has the formula:

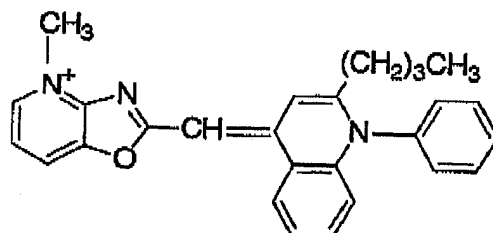


62. (Previously Added) The compound according to Claim 60, wherein said compound has the formula:

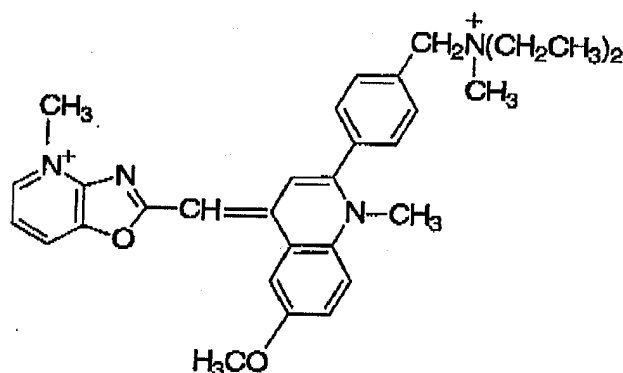


63. (Previously Added) The compound according to Claim 60, wherein said compound has the formula:

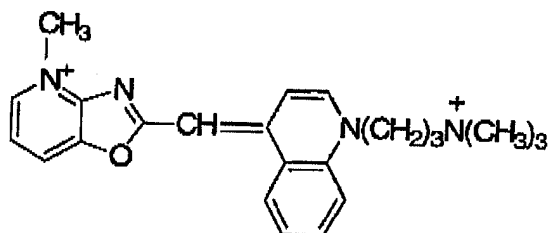
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64. (Previously Added) The compound according to Claim 60, wherein said compound has the formula:



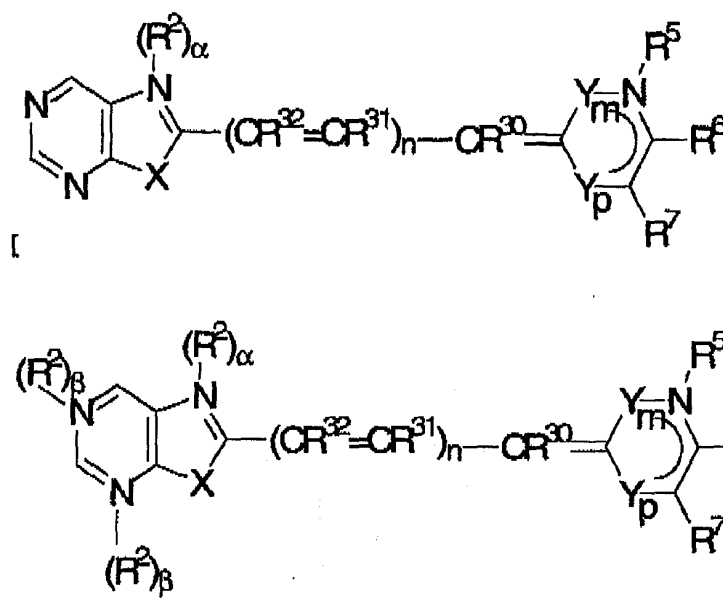
65. (Previously Added) The compound according to Claim 60, wherein said compound has the formula:



66. (Currently Amended) A compound having formula:



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wherein  $R^2$  is an alkyl having 1-6 carbon atoms and fused 6-membered aromatic ring is optionally substituted at a ring carbon by methylthio;

X is selected from the group consisting of O[,] and S, [Se,  $NR^{15}$ , and  $CR^{16}R^{17}$  wherein  $R^{15}$  is hydrogen or an alkyl group having 1-6 carbons and  $R^{16}$  and  $R^{17}$  are independently alkyl groups having 1-6 carbons];

$n = 0, 1$  or  $2$ ;

$[\alpha = 1]$   $\alpha$  is 0 or 1 and  $\beta$  is 0 or 1 provided that  $\alpha + \text{all } \beta = 1$ ;

Y is  $-CR^3=CR^4-$ ;

p and m = 0 or 1, such that  $p + m = 1$ ;

$R^3$ ,  $R^4$ ,  $R^6$ , and  $R^7$  are independently selected from the group consisting of hydrogen, an alkyl having 1-6 carbons, a halogen, a CYCLIC SUBSTITUENT,  $-OR^8$ ,  $-SR^8$ ,  $-(NR^8R^9)$ , TAIL and BRIDGE wherein  $R^8$  and  $R^9$  are independently alkyl groups having 1-6 carbons

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or 1-2 alicyclic or aromatic rings; or  $R^6$  and  $R^8$  taken in combination are  $-(CH_2)_2-W-(CH_2)_2-$  where  $W$  is a single bond,  $-O-$ ,  $-CH_2-$ , or  $-NR^{10}-$ , where  $R^{10}$  is H or an alkyl having 1-6 carbons;

or  $R^6$  and  $R^7$  taken in combination form a fused 6-membered aromatic ring wherein ring substituents  $R^{11}$ ,  $R^{12}$ ,  $R^{13}$ , and  $R^{14}$  are independently selected from the group consisting of hydrogen, halogen,  $-OR^8$ ,  $-SR^8$ ,  $-(NR^8R^8)$ , CYCLIC SUBSTITUENT, TAIL, BRIDGE, and an alkyl having 1-6 carbons;

$R^5$  is selected from the group consisting of CYCLIC SUBSTITUENT, TAIL, BRIDGE, a pair of electrons, sulfoalkyl and an alkyl having 1-6 carbons;

$R^{30}$ ,  $R^{31}$ , and  $R^{32}$  are independently selected from the group consisting of H, alkyl having 1-6 carbons, cycloalkyl having 3-10 carbons, aryl, and heteroaryl; and,

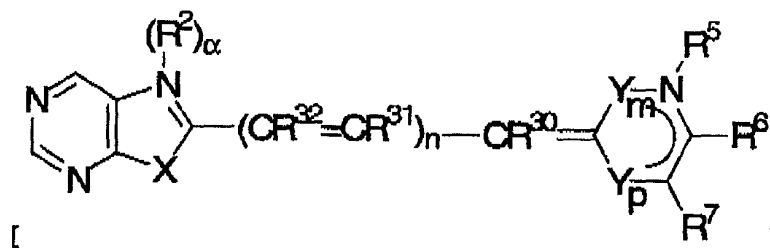
when present, BRIDGE is attached to a DYE compound provided that no more than one of  $R^3$ ,  $R^4$ ,  $R^5$ ,  $R^6$ ,  $R^7$ ,  $R^{11}$ ,  $R^{12}$ ,  $R^{13}$  and  $R^{14}$  is BRIDGE;

wherein;

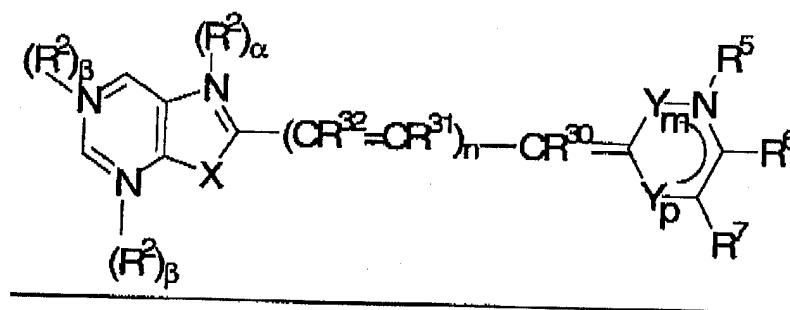
BRIDGE is independently a single covalent bond or a covalent linkage having 1-20 nonhydrogen atoms selected from the group consisting of C, N, O and S;

TAIL is a heteroatom-containing moiety;

DYE is a compound having formula



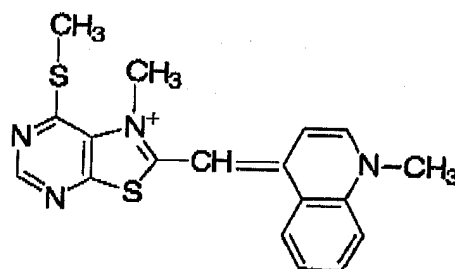
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wherein X,  $R^2$ ,  $\alpha$ ,  $\beta$ , n,  $Y_m$ ,  $Y_p$ ,  $R^5$ ,  $R^6$ ,  $R^7$ ,  $R^{30}$ ,  $R^{31}$  and  $R^{32}$  are as defined above provided that BRIDGE not be any of  $R^3$ ,  $R^4$ ,  $R^5$ ,  $R^6$ ,  $R^7$ ,  $R^{11}$ ,  $R^{12}$ ,  $R^{13}$  and  $R^{14}$ .

67. (Previously Added) The compound according to Claim 66, wherein said 6-membered aromatic ring is substituted by methylthio; X is S; n is 0; m is 1;  $R^3$ ,  $R^4$ ,  $R^{11}$ ,  $R^{12}$ ,  $R^{13}$  and  $R^{14}$  are hydrogen and  $R^5$  is methyl.

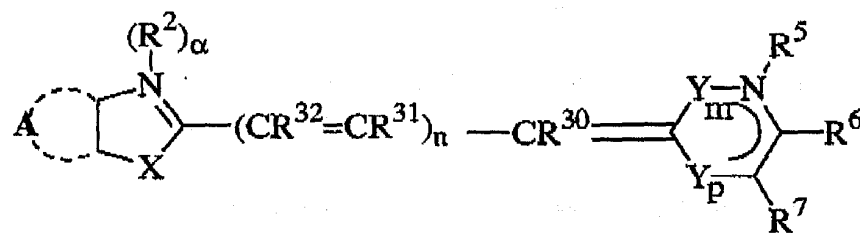
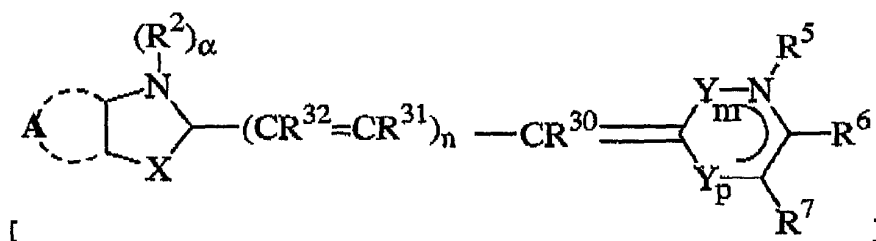
68. (Previously Added) The compound according to Claim 67, wherein said compound has the formula:



69. (Currently Amended) A solution for staining nucleic acid polymers or poly(amino acids) wherein said solution comprises:

a) one or more compounds having formula

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wherein A represents the atoms necessary to form one to two fused aromatic rings having 6 atoms in each ring selected from the group consisting of  $-C-$ ,  $CH$  or  $N(R^2)^\beta$ , provided at least one of said ring atoms is  $N(R^2)^\beta$  wherein aromatic carbons are optionally substituted one or more times by substituents selected from the group consisting of hydrogen, alkyl having from 1-6 carbons, alkoxy having from 1-6 carbons, trifluoromethyl, halogen, methylthio,  $-L-R_x$  and  $-L-S_o$ ;

X is selected from the group consisting of  $O[.]$  and  $S[.]$ , Se,  $NR^{15}$ , and  $CR^{16}R^{17}$  wherein  $R^{15}$  is hydrogen or an alkyl group having 1-6 carbons and  $R^{16}$  and  $R^{17}$  are independently alkyl groups having 1-6 carbons, or  $R^{16}$  and  $R^{17}$  taken in combination complete a five or six membered saturated ring];

$\alpha$  is 0 or 1 and  $\beta$  is 0 or 1 provided that  $\alpha + \text{all } \beta = 1$ ;

$R^2$  is selected from the group consisting of  $-L-R_x$ ,  $-L-S_o$ , TAIL, BRIDGE and an alkyl group having 1-6 carbons that is optionally substituted by sulfo, carboxy, or amino;

$n = 0, 1$  or  $2$ ;

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Y is  $-\text{CR}^3=\text{CR}^4-$ ;

p and m = 0 or 1, such that  $p + m = 1$ ;

$\text{R}^3$ ,  $\text{R}^4$ ,  $\text{R}^6$ , and  $\text{R}^7$  are independently selected from the group consisting of hydrogen, an alkyl that is saturated or unsaturated, linear or branched, having 1-6 carbons, a halogen, a CYCLIC SUBSTITUENT,  $-\text{OR}^8$ ,  $-\text{SR}^8$ ,  $-(\text{NR}^8\text{R}^9)$ , TAIL, BRIDGE,  $-\text{L-R}_x$  and  $-\text{L-S}_c$  wherein  $\text{R}^8$  and  $\text{R}^9$  are independently alkyl groups having 1-6 carbons or 1-2 alicyclic or aromatic rings; or  $\text{R}^8$  and  $\text{R}^9$  taken in combination are  $-(\text{CH}_2)_2\text{-W-(CH}_2)_2-$  where W is a single bond,  $-\text{O}-$ ,  $-\text{CH}_2-$ , or  $-\text{NR}^{10}-$ , where  $\text{R}^{10}$  is H or an alkyl having 1-6 carbons;

or  $\text{R}^6$  and  $\text{R}^7$  taken in combination form a fused 6-membered aromatic ring wherein ring substituents  $\text{R}^{11}$ ,  $\text{R}^{12}$ ,  $\text{R}^{13}$ , and  $\text{R}^{14}$  are independently selected from the group consisting of hydrogen, halogen,  $-\text{OR}^8$ ,  $-\text{SR}^8$ ,  $-(\text{NR}^8\text{R}^9)$ , a CYCLIC SUBSTITUENT, TAIL, BRIDGE,  $-\text{L-R}_x$ ,  $-\text{L-S}_c$  and a saturated or unsaturated alkyl having 1-6 carbons that is linear or branched;

$\text{R}^5$  is selected from the group consisting of CYCLIC SUBSTITUENT, TAIL, BRIDGE,  $-\text{L-R}_x$ ,  $-\text{L-S}_c$ , a pair of electrons, sulfoalkyl and a saturated or unsaturated alkyl having 1-6 carbons that is linear or branched;

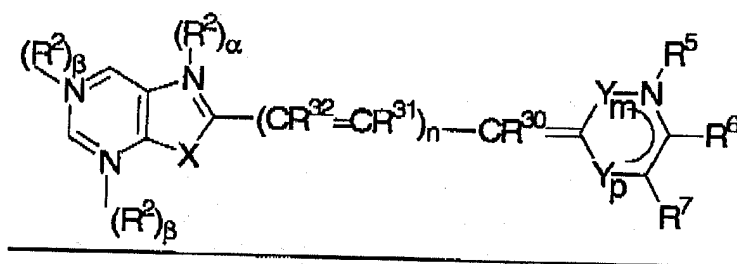
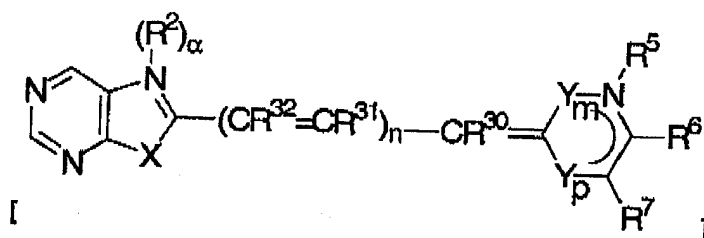
$\text{R}^{30}$ ,  $\text{R}^{31}$ , and  $\text{R}^{32}$  are independently selected from the group consisting of hydrogen, alkyl having 1-6 carbons, cycloalkyl having 3-10 carbons, aryl, and heteroaryl; and,

when present, BRIDGE is attached to a DYE compound provided that no more than one of  $\text{R}^2$ ,  $\text{R}^3$ ,  $\text{R}^4$ ,  $\text{R}^5$ ,  $\text{R}^6$ ,  $\text{R}^7$ ,  $\text{R}^{11}$ ,  $\text{R}^{12}$ ,  $\text{R}^{13}$ ,  $\text{R}^{14}$  and  $\text{R}^{15}$  is BRIDGE;

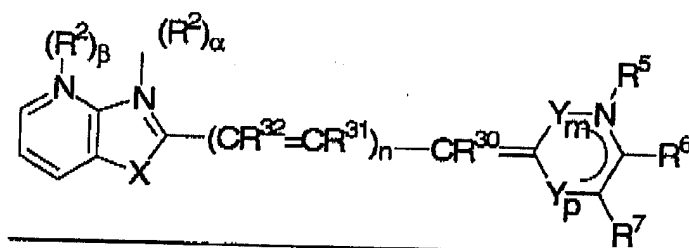
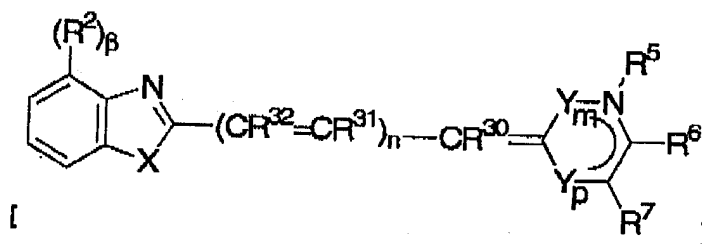
wherein

L and BRIDGE are independently a single covalent bond or a covalent linkage having 1-20 nonhydrogen atoms selected from the group consisting of C, N, O and S;

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or



71. (Currently Amended) The solution according to Claim 70, wherein  $R^2$  is methyl; said 6-membered aromatic carbons are optionally substituted one or more times by substituents selected from the group consisting of hydrogen, alkyl having from 1-6 carbons, halogen, methylthio; [X is S or O;]  $n = 0$ ;  $m = 1$ ;

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$R^3$  and  $R^4$  are independently selected from the group consisting of hydrogen, alkyl, CYCLIC SUBSTITUENT and TAIL;

$R^6$  and  $R^7$  taken in combination form a fused 6-membered aromatic ring wherein ring substituents  $R^{11}$ ,  $R^{12}$ ,  $R^{13}$ , and  $R^{14}$  are independently hydrogen,  $-OR^8$ , or an alkyl having 1-6 carbons wherein  $R^8$  is methyl;

$R^5$  is selected from the group consisting of CYCLIC SUBSTITUENT, TAIL, BRIDGE, a pair of electrons, and methyl;

$R^{90}$  is hydrogen.

72. (Previously Added) The solution according to Claim 71, wherein  $R^3$  is hydrogen, said CYCLIC SUBSTITUENT is an unsubstituted aryl and TAIL comprises LINK that is a single covalent bond, SPACER that is a phenyl ring or a linear alkyl and CAP comprising formula  $-(CH)_2N^+CH_3(CH_2CH_3)_2$  or formula  $-N(CH_3)_3$ .

73. (Previously Added) The solution according to Claim 72, wherein  $R^5$  is BRIDGE comprising formula  $-(CH_2)_3N(CH_3)CH_2-$  wherein DYE is attached to said BRIDGE.

74. (Previously Added) The solution according to Claim 72 or 73 wherein said organic solvent is DMSO.

Respectfully submitted,

Date: March 13, 2003

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